

3, 14, 16, 18, 19, 20, 24 to 31. Utah, 13, 15, 25. Vermont, 5, 17, 21. Virginia, 13, 14, 17, 20, 27, 28. Washington, 4, 11, 24, 25, 28, 29. West Virginia, 13, 14, 15, 17, 20, 21. Wisconsin, 2, 3, 16, 17, 20.

## HAIL.

The following are the dates on which hail fell in the respective States:

Arkansas, 2. California, 13, 14, 29, 30. Illinois, 17. Indiana, 17. Mississippi, 19. Missouri, 2. Texas, 30.

## WIND.

The prevailing winds for January, 1897, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

## HIGH WINDS.

Maximum wind velocities are given in Table I, which also gives the altitude of the Weather Bureau anemometers above the ground. Maxima of 50 miles or more per hour were reported during this month at regular stations of the Weather Bureau as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex.	2	54	n.	Havre, Mont.	21	50	ne.
Block Island, R. I.	21	51	se.	Huron, S. Dak.	3	50	nw.
Do.	23	53	nw.	Do.	4	51	nw.
Buffalo, N. Y.	17	59	w.	Indianapolis, Ind.	17	57	sw.
Do.	18	55	w.	Nashville, Tenn.	3	53	s.
Do.	22	55	w.	New York, N. Y.	18	60	nw.
Do.	23	55	w.	Do.	23	53	w.
Do.	25	58	w.	Do.	26	52	w.
Do.	26	55	w.	Tatoosh Island, Wash.	24	58	e.
Chicago, Ill.	4	51	w.	Do.	25	60	e.
Do.	17	53	w.	Toledo, Ohio.	17	50	sw.
Cleveland, Ohio.	23	51	w.	Williston, N. Dak.	21	55	n.
Eastport, Me.	18	56	se.	Woods Hole, Mass.	21	50	se.
Fort Canby, Wash.	25	52	se.	Do.	26	56	w.
Do.	26	54	e.	Do.	28	54	ne.

The resultant winds, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table VIII. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

## SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 22 regular stations of the Weather Bureau by its photographic, and at 35 by its thermal effects. At one of these stations records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table X for each hour of local mean time. In order to complete the record of the duration of cloudiness these registers are supplemented by special personal observations of the state of the sky near the sun in the hours after sunrise and before sunset, and the cloudiness for these hours has been added as a correction to the instrumental records, whence results a complete record of the duration of sunshine from sunrise to sunset.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table X.

## Difference between instrumental and personal observations of sunshine.

Stations.	Apparatus.	Total possible duration for the whole month.	Personal estimated area of clear sky.	Instrumental record of sunshine.			
				Photographic.	Difference.	Thermometric.	Difference.
Tampa, Fla.	T.	339.7	52				
Galveston, Tex.	P.	336.8	36		- 3	55	+ 3
New Orleans, La.	T.	334.9	30			32	+ 2
Savannah, Ga.	P.	330.5	48		- 5		
Vicksburg, Miss.	T.	330.5	55			56	+ 1
Charleston, S. C.	T.	318.5	51			54	+ 3
Phoenix, Ariz.	P.	318.5	67		+ 6		
San Diego, Cal.	P.	318.5	58		+ 9		
Atlanta, Ga.	T.	316.2	48			44	+ 1
Los Angeles, Cal.	P.	316.2	58		+ 8		
Wilmington, N. C.	T.	316.2	56			60	+ 4
Chattanooga, Tenn.	T.	314.6	41			42	+ 1
Little Rock, Ark.	T.	314.6	41			58	+ 12
Nashville, Tenn.	P.	311.8	49			55	+ 6
Raleigh, N. C.	T.	311.8	47			55	+ 8
Santa Fe, N. Mex.	P.	311.8	56		+ 9		
Fresno, Cal.	T.	309.0	22			19	- 3
Dodge City, Kans.	P.	306.5	61		+ 7		
Louisville, Ky.	T.	306.5	37			45	+ 8
San Francisco, Cal.	T.	306.5	40			53	+ 13
Atlantic City, N. J.	P.	303.8	48		+ 6		
Baltimore, Md.	T.	303.8	45			38	- 7
Cincinnati, Ohio.	T.	303.8	37			38	+ 1
Kansas City, Mo.	P.	303.8	49		+ 4		
St. Louis, Mo.	T.	303.8	43			56	+ 13
Washington, D. C.	P.	303.8	50		+ 4		
Columbus, Ohio.	T.	301.1	54		+ 11		
Denver, Colo.	P.	301.1	37			56	+ 19
Indianapolis, Ind.	T.	301.1	44			54	+ 10
Philadelphia, Pa.	P.	296.4	46		+ 16		
Cheyenne, Wyo.	P.	296.4	34		- 1		
Eureka, Cal.	P.	296.4	45			54	+ 9
New York, N. Y.	P.	296.4	48		+ 4		
Omaha, Nebr.	P.	296.4	26			20	- 6
Pittsburg, Pa.	T.	296.4	25		+ 19		
Salt Lake City, Utah.	P.	296.5	25			26	+ 1
Binghamton, N. Y.	T.	296.5	39			46	+ 7
Boston, Mass.	T.	296.5	37			38	+ 1
Chicago, Ill.	T.	296.5	18			19	+ 1
Cleveland, Ohio.	T.	296.5	53			54	+ 1
Des Moines, Iowa.	T.	296.5	27			34	+ 7
Detroit, Mich.	T.	296.5	39			35	- 4
Dubuque, Iowa.	T.	296.5	30			37	+ 7
Albany, N. Y.	T.	292.7	21			28	+ 2
Buffalo, N. Y.	T.	292.7	34			30	+ 6
Rochester, N. Y.	P.	292.7	33		+ 6		
Northfield, Vt.	P.	292.7	49			56	+ 7
Portland, Me.	P.	292.7	35		+ 15		
Eastport, Me.	P.	292.7	38			39	
Minneapolis, Minn.	P.	292.7	38		0		
St. Paul, Minn.	P.	292.7	39			24	- 5
Portland, Oreg.	P.	293.1	29		- 7		
Bismarck, N. Dak.	P.	279.9	35		+ 7		
Helena, Mont.	P.	279.9	41		0		
Seattle, Wash.	P.	276.2	25			30	- 5
Spokane, Wash.	P.	276.2	20		- 11		

\* Instrumental record is for 23 days, for which the total possible is 214.5.

† No personal record is kept at Minneapolis.

## COMPARISON OF DURATIONS AND AREAS.

The sunshine registers give the durations of effective sunshine whence the duration relative to possible sunshine is derived; the observers' personal estimates give the percentage of area of clear sky. These numbers have no necessary relation to each other, since stationary banks of clouds may obscure the sun without covering the sky, but when all clouds have a steady motion past the sun and are uniformly scattered over the sky, the percentages of duration and of area agree closely. For the sake of comparison, these percentages have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for January, 1897, is 5 per